Express Mail ET029404253US

APPLICATION

FOR

UNITED STATES LETTERS PATENT

APPLICANT NAME: Brian S. Beaman *et al.*

TITLE: ELECTRICAL COUPLING OF SUBSTRATES BY CONDUCTIVE BUTTONS

DOCKET NO.: END920010021US1

INTERNATIONAL BUSINESS MACHINES CORPORATION

ELECTRICAL COUPLING OF SUBSTRATES BY CONDUCTIVE BUTTONS

Background of the Invention

1. Technical Field

The present invention discloses a method and structure for electrically joining two substrates.

2. Related Art

FIG. 1 depicts a top view of a substrate **10** with a two-dimensional array of electrically conductive pads **12** (e.g., gold or gold-plated pads) on a surface of the substrate **10**, in accordance with the related art. The substrate **10** is an electrical substrate such as, *inter alia*, a printed wiring board or an electronic module (e.g., a module of a chip carrier with one or more attached semiconductor chips).

FIG. 2 depicts a cross-sectional view of an electrical structure **13** comprising substrates **14** and **18**, each such substrate being of the type shown in FIG. 1. As an example, the substrate **18** may include a printed wiring board and the substrate **14** may include an electronic module. The substrate **14** has electrically conductive pads **16**, and the substrate **18** has electrically conductive pads **20**. A conductive coupler **22** permanently electrically couples the substrate **14** to the substrate **18**. The conductive coupler **22** may be, *inter alia*, a solder ball, a solder column, etc.

A problem with the related art of FIG. 2 is that electrical structure **13** is vulnerable to

solder fatigue and failure at a contact surface **17** between the conductive pad **16** and the conductive coupler **22**, or at a contact surface **21** between the conductive pad **20** and the conductive coupler **22**. For example, the failure could result from thermal strain on the conductive coupler **22** introduced during temperature transients, said thermal strain resulting from differential coefficient of thermal expansion (CTE) between the substrate **14** and the conductive coupler **22**, between the substrate **18** and the conductive coupler **22**, between the substrate **14** and the substrate **18**, etc. Accordingly, there is a need for a method and structure that reduces the probability of such failure.

Another problem with the related art of FIG. 2 is that the electrical structure **13** cannot be easily repaired or upgraded in the field. Accordingly, there is a need for a method and structure that facilitates repairing or upgrading the electrical structure **13** in the field.

Summary of the Invention

The present invention provides an electrical structure comprising a conductive button, said conductive button including:

a dielectric core; and

a conductive wiring helically wound circumferentially around the dielectric core, wherein the conductive wiring terminates in at least two end contacts at a first end of the conductive button, and wherein the conductive wiring terminates in at least two end contacts at a second end of the conductive button.

The present invention provides a method for forming an electrical structure; comprising: